NASA TECH BRIEF

Means for Improving Apparent Resolution of Television

A means is described that improves the apparent resolution of television video presentations. The technique depends on the short term temporal integration characteristics of the observer's visual system and involves a minimum of electronics.

Observing a single frame of motion picture film under a microscope reveals surprisingly poor detail compared with the effect achieved when the picture is projected at normal frame rates with professional equipment. A portion of this apparent difference results from the random grain structure in the film emulsion, and the moving picture viewer uses the different information on succeeding frames to piece together the most probable picture content. Considering the TV raster as "grain", existing standards dictate that the raster appear in the same position on each successive frame and this does not yield the same effect as that produced by motion picture film. To achieve the desired effect with TV, it is necessary to change the phase relationship between horizontal and vertical oscillators at the start of each frame and maintain this precise relationship throughout both fields of the frame. Change is made to a new phase relationship at the start of each succeeding frame and maintained throughout the frame at both camera and monitor in order to maintain the correct positional relationships of imagery.

The technique involved here serves to displace the raster by a discrete fraction of the width of a raster line on each succeeding frame so that the eye can perform a temporal integration of the different information in the different raster "grain". This phase shift is accomplished by using a suitable switching time delay in one of the oscillators.

The vertical drive pulse train from the sync generator is first formed into a group of pulse trains and fed into a switching time delay that passes one pulse train and delays the next by a preselected discrete time. The trains are then broken into pulse pairs, each of which retains the basic (63,492 μsec) timing between the leading edge of the first pulse of the pair and the leading edge of the second pulse. This timing relationship causes consecutive fields to interlace in their formation of a frame. The pulse pairs are then recombined into a pulse train that has the desired inter-pulse-pair timing. This causes the frames to be shifted with respect to one another and to become interlaced. The recombined pulse train is now split into two trains, one fed to a monostable that shapes the pulses for the camera vertical oscillator and the other fed to a monostable for final shaping at the monitor vertical oscillator.

Notes:

1. This technique could have application wherever high resolution is required as in TV monitoring of the fine detail of surgical operations.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Electronics Research Center
   575 Technology Square
   Cambridge, Massachusetts 02139
   Reference: B67-10152

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Edwin H. Hilborn
(ERC-65)

Category 01